

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Yung Yip; Alan R. Olson	Examiner:	Tanh Q. Nguyen
Serial No.:	10/047,280	Group Art Unit:	2182
Filed:	January 14, 2002	Docket No.:	10305US01
Title:	SYSTEM HAVING TAPE DRIVE EMULATOR AND DATA CARTRIDGE CARRYING A NON-TAPE STORAGE MEDIUM		

SECOND SUPPLEMENTAL DECLARATION UNDER 37 C.F.R. 1.131

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

We, Yung Yip and Alan R. Olson, declare as follows:

1. We are named inventors in above-referenced patent Application Serial No.10/047,280.
2. Each of us is an employee of Imation Corp., the assignee of record for the present application.
3. As evidenced by this Declaration and Exhibit A referenced by this Declaration, we conceived the inventions set forth in claims 1, 2, 4-8, 10-16, 19, 26, 27 and 30-34 of this application prior to October 5, 2001, and worked diligently on constructive reduction of such inventions to practice from prior to October 5, 2001 to January 14, 2002, the filing date of this application.

Conception

4. Exhibit A, attached to this Declaration, is an Invention Record for Imation Corp. prepared prior to October 5, 2001.

5. Exhibit A and this Declaration provide evidence of our conception of the inventions set forth in claims 1, 2, 4-8, 10-16, 19, 26, 27 and 30-34 prior to October 5, 2001.

6. Claim 1 requires a system comprising a data cartridge carrying a non-tape storage medium, wherein the data cartridge includes read/write circuitry to access the non-tape storage medium and an external electrical connector coupled to the read/write circuitry. Claim 1 further requires a tape drive emulator having an electrical socket to receive the electrical connector of the data cartridge.

We rely on Exhibit A as evidence that we conceived the elements set forth in claim 1 prior to October 5, 2001. Figure 1 of Exhibit A illustrates an industry standard data cartridge housing that has been configured to contain an internal disk drive. On page 2, Exhibit A states that "the data storage element of an existing removable tape cartridge system is replaced with [an] alternative medium such as a rigid disk drive." On page 2, Exhibit A further states that one benchmarked disk drive is a 40 GB IDE disk drive with a minimum sustained transfer rate of 20 MB/s. On page 2, Exhibit A states that "[t]he data cartridge would contain at least the complete mechanical components of the disk drive, including motor, disk(s), and head actuator assembly. Analog electronics such as preamps and write drivers should also be contained within the cartridge." Figure 1 of Exhibit A illustrates the data cartridge having an electrical interface for coupling to a tape drive emulator.

On page 2, Exhibit A states that "[t]he tape drive portion of the system would be replaced with an electronic interface, power supply, and receptacle mechanism for seating and electrically connecting to the cartridge." Figure 1 of Exhibit A illustrates the drive emulator having an electrical socket capable of receiving the data cartridge.

7. Claim 2 requires that the socket comprises a zero insertion force (ZIF) socket having a set of connectors that engage the electrical connections of the data cartridge. We rely on Exhibit A as evidence that we conceived the elements set forth in claim 2 prior to October 5, 2001. Exhibit A illustrates the tape drive emulator as having a zero insertion force (ZIF) connector. On page 3, Exhibit A states that "the drive emulator can contain some form of motorized Zero Insertion Force (ZIF) socket for making robust electrical connection to the cartridge I/O and power input (emphasis added)."

8. Claim 4 requires a system comprising a data cartridge carrying a non-tape storage medium, wherein the data cartridge includes an external electrical connector. Claim 4 further requires a tape drive emulator having an electrical socket to receive the electrical connector of the data cartridge.

We rely on Exhibit A as evidence that we conceived the elements set forth in claim 4 prior to October 5, 2001. Figure 1 of Exhibit A illustrates an industry standard data cartridge housing that has been configured to contain an internal disk drive. On page 2, Exhibit A states that "the data storage element of an existing removable tape cartridge system is replaced with [an] alternative medium such as a rigid disk drive." On page 2, Exhibit A further states that one benchmarked disk drive is a 40 GB IDE disk drive with a minimum sustained transfer rate of 20 MB/s. On page 2, Exhibit A states that "[t]he data cartridge would contain at least the complete mechanical components of the disk drive, including motor, disk(s), and head actuator assembly. Analog electronics such as preamps and write drivers should also be contained within the cartridge." Figure 1 of Exhibit A illustrates the data cartridge having an electrical interface for coupling to a tape drive emulator.

On page 2, Exhibit A states that "[t]he tape drive portion of the system would be replaced with an electronic interface, power supply, and receptacle mechanism for seating and electrically connecting to the cartridge." Figure 1 of Exhibit A illustrates the drive emulator having an electrical socket capable of receiving the data cartridge.

9. Claim 5 requires that the tape drive emulator comprises a host interface to electrically couple the tape drive emulator to a host computing device. We rely on Exhibit A as evidence that we conceived the elements set forth in claim 5 prior to October 5, 2001.

Figure 1 of Exhibit A illustrates the drive emulator having an internal computer or application specific integrated circuit (ASIC) and a "Connection to Host." On page 3, Exhibit A states that "[t]he drive emulator receives commands and data from the host application An example would be a SCSI host interface between host and emulator"

10. Claim 6 requires that the host interface conforms to one of the Small Computer System Interface (SCSI), the Fiber Channel interface, and the Enhanced Integrated Drive Electronics (EIDE) interface. We rely on Exhibit A as evidence that we conceived the elements set forth in claim 6 prior to October 5, 2001.

On page 3, Exhibit A states that "[t]he drive emulator function can be executed by a single board computer like a PC104, with the appropriate interface adapters (SCSI, EIDE, ESCON, FIBRE). This can be accomplished with commercially off-the-shelf components."

11. Claim 7 requires that the tape drive emulator comprises a translation unit to translate commands between the host interface and the electrical socket. We rely on Exhibit A as evidence that we conceived the elements set forth in claim 7 prior to October 5, 2001. On page 3, Exhibit A specifically states that "[t]he drive emulator receives commands and data from the host application An example would be a SCSI host interface between host and emulator" Page 3, Exhibit A also states that "[t]he drive emulator receives commands and data from the host application, interprets it [the commands and data] into the disk drive interface format, and vice versa [emphasis added]."

12. Claim 8 requires that the translation unit receives data stream commands from the host interface and translates the data stream commands into disk drive format commands. We rely on Exhibit A as evidence that we conceived the elements set forth in claim 8 prior to October 5, 2001.

On page 3, Exhibit A states that “[t]he drive emulator receives commands and data from the host application An example would be a SCSI host interface between host and emulator” Page 3, Exhibit A states that “[t]he drive emulator receives commands and data from the host application, interprets it [the commands and data] into the disk drive interface format, and vice versa.”

13. Claim 10 requires that the non-tape storage medium comprises a disk-shaped storage medium. We rely on Exhibit A as evidence that we conceived the elements set forth in claim 10 prior to October 5, 2001.

On page 1, Exhibit A states that “rapid access and high data rate data cartridge systems compatible with existing automation and hosts can be achieved by replacing tape with disk drives or other forms of storage elements.” Figure 1 of Exhibit A illustrates an industry standard data cartridge housing that has been configured to contain an internal disk drive. On page 2, Exhibit A states that “[t]he data storage element of an existing removable tape cartridge system is replaced with [an] alternative medium such as a rigid disk drive.” On page 2, Exhibit A further states that one benchmarked disk drive is a 40 GB IDE disk drive with a minimum sustained transfer rate of 20 MB/s. Page 2, Exhibit A states that “[t]he data cartridge would contain at least the complete mechanical components of the disk drive, including motor, disk(s), and head actuator assembly. Analog electronics such as preamps and write drivers should also be contained within the cartridge.” Figure 1 of Exhibit A illustrates the data cartridge having an electrical interface for coupling to a tape drive emulator.

14. Claim 11 requires that the data cartridge includes a self-contained disk drive housing the disk-shaped storage medium and a disk driver controller. Claim 12 requires that the data cartridge further comprises a disk drive controller to control access to the non-tape storage medium, wherein the controller communicates with the tape drive emulator according to one of the Small Computer System Interface (SCSI), the Fibre Channel interface, and the Enhanced Integrated Drive Electronics / AT Attachment (EIDE/ATA) interface.

We rely on Exhibit A as evidence that we conceived the elements set forth in claims 11 and 12 prior to October 5, 2001. Figure 1 of Exhibit A illustrates an industry standard data cartridge housing that has been configured to contain an internal disk drive.

On page 2, Exhibit A states that “[t]he data storage element of an existing removable tape cartridge system is replaced with [an] alternative medium such as a rigid disk drive.”

On page 2, Exhibit A further states that one benchmarked disk drive is a 40 GB IDE disk drive with a minimum sustained transfer rate of 20 MB/s. On page 2, Exhibit A states that “[t]he data cartridge would contain at least the complete mechanical components of the disk drive, including motor, disk(s), and head actuator assembly. Analog electronics such as preamps and write drivers should also be contained within the cartridge.”

On page 2, Exhibit A states that “[a]ll of the disk drive electronics can be contained within the cartridge (emphasis added).”

On page 3, Exhibit A states that “[t]he drive emulator function can be executed by a single board computer like a PC104, with the appropriate interface adapters (SCSI, EIDE, ESCON, FIBRE). This can be accomplished with commercially off-the-shelf components.”

15. Claim 13 requires that the socket of the tape drive emulator provides power to the controller of the data cartridge via the electrical connector of the data cartridge.

We rely on Exhibit A as evidence that we conceived the elements set forth in claim 13 prior to October 5, 2001.

Exhibit A illustrates the tape drive emulator as having a zero insertion force (ZIF) connector. On page 3, Exhibit A clearly states that “[t]he drive emulator can contain some form of motorized Zero Insertion Force (ZIF) socket for making robust electrical connection to the cartridge I/O and power input (emphasis added).” Thus, the submitted Exhibit A specifically describes that the ZIF connector of the tape drive emulator makes an electrical connection to a power input of the cartridge.

16. Claim 14 requires that the data cartridge and the tape drive emulator are compatible with existing automation systems. We rely on Exhibit A as evidence that we conceived the elements set forth in claim 14 prior to October 5, 2001.

On page 2, Exhibit A expressly states that "the invention describes a rapid access data cartridge and drive emulator which is compatible with existing tape drive formats, automation systems and host applications."

On page 1, Exhibit A states that "rapid access and high data rate data cartridge systems compatible with existing automation and hosts can be achieved by replacing tape with disk drives or other forms of storage elements."

On page 2, Exhibit A lists numerous existing tape library automation systems with which the tape drive emulator could be compatible, including automation systems supporting the 3590, 9840, 9940, SLR, DLT and LTO tape data cartridges.

17. Claim 15 requires that the data cartridge comprise a housing conforming to industry standard dimensions for a magnetic tape drive cartridge.

We rely on Exhibit A as evidence that we conceived the elements set forth in claim 15 prior to October 5, 2001.

On page 2, Exhibit A states that "the invention describes a rapid access data cartridge and drive emulator which is compatible with existing tape drive formats, automation systems and host applications."

On page 2, Exhibit A lists numerous existing industry-standard tape data cartridges for which the tape medium may be replaced with a disk-based storage medium. Exhibit A specifically lists the 3590, 9840, 9940, SLR, DLT and LTO industry-standard tape data cartridges.

On page 1, Exhibit A states that "rapid access and high data rate data cartridge systems compatible with existing automation and hosts can be achieved by replacing tape with disk drives or other forms of storage elements."

On page 2, Exhibit A states that "[t]he data cartridge physical dimensions and features are compatible with existing library automation."

18. Claim 16 requires that the tape drive emulator has a form factor of an industry standard tape drive.

We rely on Exhibit A as evidence that we conceived the elements set forth in claim 16 prior to October 5, 2001.

On page 2, Exhibit A states that "the invention describes a rapid access data cartridge and drive emulator which is compatible with existing tape drive formats, automation systems and host applications (emphasis added)."

On page 3, Exhibit A further states that the "data cartridge physical dimensions and features are compatible with existing library automation."

19. Claims 26, 27 and 30-34 are directed to a tape drive emulator having requirements similar to those discussed above. As discussed above, we rely on Exhibit A as evidence that we conceived the elements set forth in claims 26, 27 and 30-34 prior to October 5, 2001.

Diligence

20. We worked with reasonable diligence on the inventions set forth in claims 1-19 and 26-37 during the three month period from prior to October 5, 2001 to at least January 14, 2002, the filing date of this application, i.e., the date of our constructive reduction to practice.

21. During the three month period from October 5, 2001 to January 14, 2001, we worked with our representatives, Kent J. Sieffert and Eric Levinson, with reasonable diligence to prepare a first draft, a revised draft and a final draft of present patent application.

22. Any period between prior to October 5, 2001 and January 14, 2002 during which the invention was not worked on was due to holidays or normal workload.

23. On October 9, 2001, Mr. Yip met with Mr. Kent J. Sieffert, Applicants' representative. During this meeting, Mr. Yip discussed the details of the invention. Exhibit B, attached to this Declaration, is a copy of an invoice that evidences the meeting between Mr. Kent J. Sieffert and Mr. Yip.

24. Mr. Sieffert prepared a draft of the present application during this period and communicated that draft to us on December 10, 2001. Exhibit C, attached to this Declaration, is a copy of an electronic communication prepared by Mr. Sieffert and sent to us on December 10, 2001.

25. On December 14, 2001, Mr. Yip met with Mr. Kent J. Sieffert to review the draft of the present application.

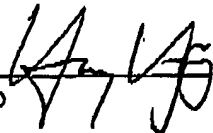
26. Exhibit D, attached to this Declaration, is a copy of an invoice that evidences the meeting between Mr. Kent J. Sieffert and Mr. Yip on December 14, 2001.

27. Exhibit E, attached to this Declaration, is a copy of an electronic communication prepared by Mr. Sieffert on December 21, 2001. As evidenced by Exhibit E, Kent J. Sieffert communicated a revised draft to us and Mr. Eric Levinson, patent counsel for Imation Corp., on December 21, 2001 for review.

28. As stated in Exhibit E, Mr. Sieffert sent Mr. Levinson drawings by regular mail on or about December 21, 2001.

29. The present application was prepared and filed on January 14, 2002, as evidenced by the filing date awarded the application.

We hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: 5/13/2005 Signed: 
Yung Yip

Date: 5/13/2005 Signed: 
Alan R. Olson

EXHIBIT A

 **imation**

Invention Record

I.I.R. # 2001-0094	Status: Recorded
Originating Imation Unit: Data Storage Systems	Send Original to I.P. Scientist/Manager: Robert W. Frits/CS/Imation
Title: Format Compatible Rapid Access Data Cartridge System with Extended Capacity	

Investigator Information:

Investigator Yung Yip	Imation Emp. Num. 684575
Tech. Ntbk. No. 250	Div. / Lab Name Data Storage Systems Lab
Investigator Alan R. Olson/DSP/Imation	Imation Emp. Num. 682008
Tech. Ntbk. No.	Div. / Lab Name Data Storage Systems Lab
Investigator	Imation Emp. Num.
Tech. Ntbk. No.	Div. / Lab Name

Include all of the following:

1. Short description of the invention:

Rapid access and high data rate data cartridge systems compatible with existing automation and hosts can be achieved by replacing tape with disk drives or other forms of storage elements.

2. Describe the utility of the invention and describe the advantages of this invention over the current art.

The convergence of unit storage cost between rigid disks and tape systems makes this concept an economically viable disruptive technology. It also provides users of library systems a new dimension for near line applications. This invention can also competes directly with optical jukebox applications.

3. Provide one or more detailed examples which illustrate the invention. Incorporate any needed sketches or informal drawing in the text of the I.I.R.

The Invention

This invention describes a rapid access data cartridge and drive emulator which is compatible with existing tape drive formats, automation systems and host applications. This invention also provides a means to extend the format capacity and data transfer rate, without changes to the host application. The concept is illustrated in figure 1.

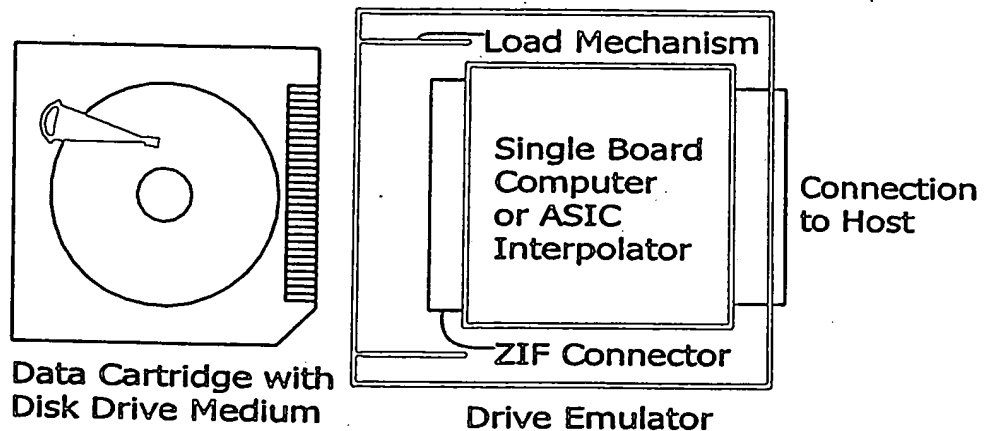


Figure 1

- ❖ The data storage element of an existing removable tape cartridge system is replaced with alternative medium such as a rigid disk drive.
 - The data cartridge physical dimensions and features are compatible with existing library automation.
 - Once the cartridge is loaded and powered up, time to data will be measured in milliseconds.
 - Current benchmark (8/2001) for single platter IDE disk drives is 40 GB, with a minimum of 20 MB/s sustained transfer rate, and approximately \$50 OEM pricing.
- ❖ The tape drive portion of the system would be replaced with an electronic interface, power supply, and receptacle mechanism for seating and electrically connecting to the cartridge. This device will herein be referred to as the "drive emulator".
 - The host application would see the drive emulator as a tape drive of the type that is being emulated.
 - Migration to larger capacity and higher data rates by upgrading the disk drive mechanism, and does not necessarily require a change in drive emulator hardware or host application drivers
 - Examples of systems where this can be implemented are 3590, 9840, 9940, SLR, DLT, and LTO.
- ❖ The data cartridge would contain at least the complete mechanical components of the disk drive, including motor, disk(s), and head actuator assembly. Analog electronics such as preamps and write drivers should also be contained within the cartridge.
- ❖ All of the disk drive electronics can be contained within the cartridge.

- The advantage of embedding all the disk drive electronics within the cartridge is the ability to use an industry standard interface (such as SCSI or IDE), without proprietary content.
- This minimizes customization, and eases migration to larger capacity drives.
- The disadvantage of embedding all the disk drive electronics into the cartridge is added weight, potentially higher cost, and lack of proprietary content.
- ❖ A portion of the disk drive electronics can reside on the drive emulator.
 - In high volume scenarios, this approach can reduce cost to the cartridge.
 - The disadvantage of this approach is a high degree of customization, restrictions on product migration, and limitations on disk drive suppliers.
- ❖ The drive emulator can contain some form of motorized Zero Insertion Force (ZIF) socket for making robust electrical connection to the cartridge I/O and power input.
- ❖ The drive emulator receives commands and data from the host application, interprets it into the disk drive interface format, and vice versa. An example would be a SCSI host interface between host and emulator, and an EIDE interface between the emulator and cartridge disk drive.
 - The drive emulator function can be executed by a single board computer like a PC104, with the appropriate interface adapters (SCSI, EIDE, ESCON, FIBRE). This can be accomplished with commercially off-the-shelf components.
 - The same functionality with higher speed and lower cost can be achieved via custom ASIC.
- ❖ Storage elements other than disk drives can also be used (ie. Flash memory).

Invoice

ATTN: Eric D. Levinson
Imation Corp. P.O. Box 64898 St. Paul, MN 55164-0898

Tax ID:41-1988229

Shumaker & Sieffert contact:

Kent J. Sieffert

EXHIBIT C

Kent J. Sieffert

From: Kent J. Sieffert
Sent: Monday, December 10, 2001 3:46 PM
To: 'edlevinson@imation.com'; 'yyip@imation.com'
Subject: Patent Application - Imation 10301US01-Tape Emulation

Yung, attached is a first draft for the above-referenced patent application. Specifically, I have attached the specification in password-protected Microsoft Word format, and figures in password-protected PDF format. I'll call you with the password.

Please review the patent application for completeness and accuracy. Please contact me with comments or suggestions.

Regards,

Kent J. Sieffert
Shumaker & Sieffert, P.A.
150 Gateway Corporate Center I
576 Bielenberg Drive
St Paul, MN 55125
tel 651-735-1100 ext. 11
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email: sieffert@ssiplaw.com
web:www.ssiplaw.com



Application - first draft.doc ... Figures.pdf (40 KB)

EXHIBIT D

Shumaker & Sieffert, P.A.
8425 Seasons Parkway, Suite 105
St. Paul, MN 55125

Invoice

Date:	No.
12/31/2001	1286

ATTN: Eric D. Levinson
Imation Corp. P.O. Box 64898 St. Paul, MN 55164-0898

TERMS	DUE DATE	YOUR REFERENCE NO	SS MATTER NO
Net 30	1/30/2002	10305	1001-203US01

DESCRIPTION	HRS/QTY	RATE	TIMEKEEPER	SERVICED	AMOUNT
Work on application.	8.5	285.00	KJS	12/5/2001	
Work on application.	5	285.00	KJS	12/6/2001	
Work on application.	0.17	285.00	KJS	12/7/2001	
Review and revise application.	1.2	310.00	SJS	12/10/2001	
Meet with Mr. Yip to review first draft of application.	2.1	285.00	KJS	12/14/2001	
Revise application.	0.7	285.00	KJS	12/18/2001	
Revise application.	3.5	285.00	KJS	12/19/2001	
Photocopies / Prints	1	0.95		12/6/2001	
			Total		

Tax ID:41-1988229

Shumaker & Sieffert contact:

Kent J. Sieffert

EXHIBIT E

Kent J. Sieffert

From: Kent J. Sieffert
Sent: Friday, December 21, 2001 2:04 PM
To: 'edlevinson@imation.com'
Cc: 'yyip@imation.com'; Kent J. Sieffert; 'sjdaly@imation.com'; Shirley A. Betlach
Subject: RE: Patent Application - Imation 10305US01-Tape Emulation



Application - Figures.pdf (40 KB)
Final.doc (80 KB...

Eric,

Attached is a final draft for the above-captioned patent application. In particular, I have attached a password protected Word file and a password-protected PDF of the figures. In addition, I am mailing you copies of the figures for filing as the PDF has dropped some markings.

Please let me know if I can be of further assistance.

Happy Holidays,

Kent